

value larger than a V_{pp} value of a continuous rf bias voltage at which the same etch rate can be obtained is given, so as to have the high ion energy which is larger than a high ion energy of the continuous rf bias voltage, is applied to a stage on which a sample is placed independently of the generation of the plasma; and

on-off modulating the rf bias voltage at least at one period of treatment of a surface of the sample in which anisotropy is high and which is prior to another period of treatment of the surface of the sample in which selectivity is higher than selectivity at the one period.

REMARKS

In light of the Advisory Action dated December 24, 2002, an RCE has been filed and claim 1, as amended, by the Amendment of December 2, 2002 which was not entered, has been further amended in response to the points raised by the Examiner.

At the outset, applicants note that claim 1 has been amended to recite the feature of "on-off modulating the rf bias voltage at least at one period of treatment of a surface of the sample in which anisotropy is high and which is prior to another period of treatment of the surface of the sample in which selectivity is higher than selectivity at the one period". Applicants note that this amendment essentially incorporates the features of original dependent claims 5 and 6 therein, wherein claim 5, as originally presented, set forth that the sample surface treatment from the beginning till the end is divided into a plurality of steps and the rf bias voltage is on-off modulated in at least one of the steps, with claim 6 reciting that the plurality of steps are grouped into a first half in which a selectivity for a substance of an underlying film is relatively low and a latter half in which the selectivity is relatively high, and the rf bias voltage is on-off modulated at least in the steps of the first half. That is, referring to Fig. 16 of the drawings of this application and the corresponding

description at pages 23-25 of the specification, it is noted that page 24, line 15 to page 25, line 5, indicates that step 2 relates to etching of the polysilicon 503 as a main part of the process, wherein the rf bias power supply 109 is on-off modulated. As described, the etch rate of the polysilicon was 300 nm/min. and the selectivity of the polysilicon and the oxide film was 20 with the etching time being set to 35 seconds. As described, the profile after completion of step 2 is shown in Fig. 16(c) and this period of surface treatment of the sample represents the one period of on-off modulating the rf bias voltage in which the anisotropy is high, as described in the paragraph bridging pages 14 and 15 of the specification, for example. As described at page 25, lines 6-21 of the specification, in the last step 3, since the thin underlying oxide film 502 is exposed, the parameters are changed so that the selectivity is high even if the etch rate of the polysilicon is lower. Specifically, continuous power of the rf bias power supply 109 was set and with these parameters, the etch rate of the polysilicon becomes 100 nm/min. and the selectivity is 50 and the etch time was set to 30 seconds. Thus, as described in this portion of the specification and page 36, line 20 to page 37, line 7, the on-off modulating the rf bias voltage at least at one period of surface treatment of the sample is clearly recited in claim 1, as amended, and finds clear basis in the specification of this application.

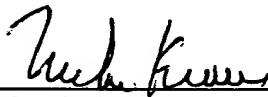
Applicants submit that such features are not disclosed or taught in the cited art for the reasons set forth in the Amendment filed December 2, 2002, which should be considered herein.

In view of the above amendments and remarks, applicants submit that all claims present in this application should now be in condition for allowance, and issuance of an action of a favorable nature is courteously solicited.

To the extent necessary, applicant's petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing

of this paper, including extension of time fees, to Deposit Account No. 01-2135 (520.36911CX2) and please credit any excess fees to such deposit account.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "Melvin Kraus", written over a horizontal line.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend claim 1 as follows:

1. (thrice amended) A method of treating a surface of a sample, comprising the steps of:

generating a plasma in a treatment chamber;

applying an rf bias voltage of a frequency so that ions of intermediate energy which promote etching reaction while providing poor directionality are reduced, and ions of high energy having a high directionality and ions of low energy which do not contribute to etching are increased, so as to have at least one peak point at a region of high ion energy and at least one peak point at a region of low ion energy for anisotropic etching, and the rf bias voltage to which a peak to peak voltage V_{pp} value larger than a V_{pp} value of a continuous rf bias voltage at which the same etch rate can be obtained is given, so as to have the high ion energy which is larger than a high ion energy of the continuous rf bias voltage, is applied to a stage on which a sample is placed independently of the generation of the plasma; and

on-off modulating the rf bias voltage at ~~a region~~ least at one period of treatment of a surface of the sample in which anisotropy is high ~~before a region and which is prior to another period of treatment of the surface of the sample~~ in which selectivity is ~~high~~ higher than selectivity at the one period.